REMARKS

This responds to the Office Action mailed on August 2, 2007. Reconsideration is respectfully requested.

Claims 1 – 3, 13, 15, 22 – 25 and 28 – 30 are amended, no claims are canceled, and no claims are added; as a result, claims 1 – 30 remain pending in this application.

§102 Rejection of the Claims

Claims 1, 2, 13, 14, 22, 28 and 29 were rejected under 35 U.S.C. § 102(b) as being anticipated by Kuwabara et al. (U.S. 2001/0015954 A1).

Applicant's claim 1, as amended is directed to phase compensating OFDM signals and comprises generating a phase compensation estimate by recursively filtering an observation vector formed by weighted pilot subcarriers of a data symbol of an orthogonal frequency division multiplexed (OFDM) packet. Claim 1 further recites applying the phase compensation estimate to ***channel equalized*** subcarriers of the data symbol in the frequency domain after performance of a Fourier transform on the data symbol. As further recited in claim 1, the pilot subcarriers are weighted to help maximize a signal to noise ratio (SNR) of the observation vector based on fading gains. The weighted pilot subcarriers form the observation vector.

As recited in claim 1, the phase compensation estimate is applied ***after*** channel equalization. This is emphasized in claim 2. Claim 2, as amended, further recites that the channel estimates used to channel equalize the subcarriers and are determined from long training symbols of the OFDM packet. As further recited in claim 2, the pilot subcarriers are weighed based on the channel estimates to help maximize a signal to noise ratio (SNR) of the observation vector.

Kuwabara performs channel equalization by applying channel estimates in the frequency domain to compensate for amplitude and phase distortion, ***but does not perform any separate or additional phase compensation after channel compensation***. As illustrated in FIG. 1 of Kuwabara, channel equalization is performed in by complex dividing unit 9 to compensate a data signal in both amplitude and phase (see Kuwabara paragraph [0037]). Interpolating unit 8 generates channel estimates H (estimates of the transmission path) which are applied by complex

dividing unit 9 (see Kuwabara paragraphs [0036 and 0037] and FIG. 1). This may be referred to as channel equalization.

Applicant finds no teaching in Kuwabara to perform a separate phase compensation after channel equalization, as recited in claim 1. As illustrated in Kuwabara, demodulation is performed by element 10 ***directly after channel equalization*** (see Kuwabara FIG. 1). Applicant's claim 1 recites that the phase compensation estimate is applied to ***channel equalized*** subcarriers. Applicant's other independent claims have similar recitations. Accordingly Applicant's claims 1, 2, 13, 14, 22, 28 and 29 are not anticipated by Kuwabara.

Claims 1, 22 and 28 were also rejected under 35 U.S.C. § 102(e) as being anticipated by McFarland et al. (U.S. 7,027,530 B2).

McFarland is similar to Kuwabara and performs channel correction (i.e., channel equalization) after the FFT by channel correction element 228 (see McFarland paragraph [0012]). McFarland uses channel estimates to correct for the effects of the channel and performs demapping and deinterleaving directly on the channel compensated signal (see McFarland paragraph [0012] and FIG. 2). Applicant finds no teaching in McFarland to perform a separate phase compensation after channel equalization, as recited in claim 1. Accordingly, Applicant's claims 1, 22 and 28 cannot be anticipated by McFarland.

Furthermore, neither Kuwabara nor McFarland generate a phase compensation estimate by recursively filtering an observation vector formed by weighted pilot subcarriers, wherein the pilot subcarriers are weighted to help maximize a SNR of the observation vector based on fading gains. Neither Kuwabara nor McFarland apply a phase compensation estimate to channel equalized subcarriers of the data symbol.

Applicant's separate phase compensation estimate ***is in addition to*** any phase and amplitude correction performed by channel compensation. This separate phase compensation, not only helps compensate for the channel, but helps compensate for phase issues that may be introduced by noise power and the phase noise of the receiver's LO. This is emphasized in claim 6 which recites that the recursively filtering is performed on the observation vector using the channel estimate, an additive noise power estimate, a signal to noise ratio (SNR) estimate, a

priori information about a dynamic model of phase, and a phase noise power value from a phase noise spectrum of a transceiver oscillator. Claims 15 and 26 have similar recitations. Claims 7 and 17 further recite that the channel estimate is generated from a long training symbol of the OFDM packet, and that the additive noise power estimate and the SNR estimate are generated from short training symbols of the OFDM packet.

Applicant finds no teaching, suggestion, or motivation for performing a separate phase compensation estimate, as discussed above, in any of the cited references.

§103 Rejection of the Claims

Claims 3-6, 9-11, 23-27 and 30 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuwabara et al., and further in view of Perets et al. ("A New Phase and Frequency Offset Estimation Algorithm for OFDM Systems Applying Kalman Filter," Dept. of Electrical Engineering-Systems, Tel Aviv University, December 2002.)

Claims 7, 8 and 15-21 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuwabara et al., Perets et al. and further in view of McFarland et al. (U.S. 7,027,530 B2).

Claim 12 was also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuwabara et al., Perets et al. and further in view of Crawford (U.S. 2002/0159533 A1).

Claims 3 and 15 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuwabara et al. in view of Proakis ("Digital Communications," 4th Edition, 2000).

Claims 3 and 15 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuwabara et al. in view of Nadgauda et al. (U.S. 2002/0177427 A1).

According to the Examiner, Kuwabara fails to disclose the weighting of pilot subcarriers based on fading gains to generate an observation vector and the recursive filtering of the observation vector to generate a phase compensation estimate. Applicant agrees with this.

Perets has been cited by the Examiner for recursively filtering an observation vector to generate a phase compensation estimate. Perets however, is concerned with the amount of phase ***rotation*** at the FFT output that grows linearly over time (see Perets page 300, Introduction paragraph, particularly line 7). This phase rotation, however, can be compensated for by rotating the phase prior to the FFT (as recited in Applicant's claim 12). There is no mention in Perets as to whether the phase and frequency compensation offsets are applied before of after the FFT.

Applicant's claim 1, on the other hand, recites that a phase compensation estimate is generated by recursively filtering an observation vector formed by weighted pilot subcarriers. Perets does not use pilot subcarriers but uses a vector measurement model that weights each data subcarrier by the channel estimate (see Perets equation 6 on line 8 of section 3 (page 301). This model is similar to conventional channel equalization, however an extended Kalman filter is used to track the phase and frequency offsets (see section 4 of Perets) introduced by the channel. In other words, Perets is performing channel compensation with a Kalman filter.

Applicant's claim 1 further distinguishes over Perets by reciting that pilot subcarriers are weighted to help maximize a signal to noise ratio (SNR) of the observation vector based on fading gains. As discussed above, Perets does not weight pilot subcarriers to form an observation vector, and furthermore, Perets does not weight the pilot subcarriers to help maximize an SNR of the observation vector based on fading gains. In Perets, the term "N" refers to the total number of subcarriers that is used. Phase and frequency offsets are tracked for N subcarriers for which the channel measurements are made (see Perets sections 3 and 4 on page 301). Thus, Perets does not use weighted pilot subcarriers for Kalman filtering.

Accordingly, the combination of Perets with Kuwabara and/or McFarland (discussed above) does not result in Applicant's claim 1. Claims 2 and 3, among others, for example, further emphasize these distinctions.

Accordingly, the rejection of claims 3-6, 9-11, 23-27 and 30 under 35 U.S.C. § 103(a) over Kuwabara in view of Perets et al, and the rejection of claims 7, 8 and 15-21 under 35 U.S.C. § 103(a) over Kuwabara et al., Perets et al. and further in view of McFarland, are believed to have been overcome.

Proakis has been cited by the Examiner for weighting pilot subcarriers based on fading gains to generate an observation vector, and recursively filtering the observation vector to generate a phase compensation estimate. Applicant respectfully disagrees with this interpretation of Proakis. Proakis teaches an adaptive fractionally spaced equalizer which weights (using N filter coefficients w_0 through w_{N-1}) and combines delayed and filtered versions of the input signal in elements (z^{-1}) (see Proakis FIG. 11.1-6 and page 672 paragraph beginning at line 21). The "N" is Proakis refers to the number of symbols that are collected in one period and is not related in

any way to pilot subcarriers (see Proakis page 672 line 32). The N filter coefficients w_0 through w_{N-1} discussed in Proakis refer to a sequence of filter coefficients and are used as equalizer taps. In other words, samples with different delays are weighted differently. There is teaching, suggestion, or motivation found in Proakis to weight pilot subcarriers based on fading gains.

Accordingly, the rejection of claims 3 and 15 under 35 U.S.C. § 103(a) as being unpatentable over Kuwabara in view of Proakis is believed to be overcome.

Claims 11, 17 25, for example, recites that the weights are complex conjugates of the fading gains of the pilot subcarriers and the fading gains being determined from the channel estimate. This is not taught, suggested, or motivated in any of the cited references.

In view of the above, Applicant submits that the rejection of claims under 35 U.S.C. § 103(a) has been overcome.

RESERVATION OF RIGHTS

In the interest of clarity and brevity, Applicant may not have addressed every assertion made in the Office Action. Applicant's silence regarding any such assertion does not constitute any admission or acquiescence. Applicant reserves all rights not exercised in connection with this response, such as the right to challenge or rebut any tacit or explicit characterization of any reference or of any of the present claims, the right to challenge or rebut any asserted factual or legal basis of any of the rejections, the right to swear behind any cited reference such as provided under 37 C.F.R. § 1.131 or otherwise, or the right to assert co-ownership of any cited reference. Applicant does not admit that any of the cited references or any other references of record are relevant to the present claims, or that they constitute prior art. To the extent that any rejection or assertion is based upon the Examiner's personal knowledge, rather than any objective evidence of record as manifested by a cited prior art reference, Applicant timely objects to such reliance on Official Notice, and reserves all rights to request that the Examiner provide a reference or affidavit in support of such assertion, as required by MPEP § 2144.03. Applicant reserves all rights to pursue any cancelled claims in a subsequent patent application claiming the benefit of

priority of the present patent application, and to request rejoinder of any withdrawn claim, as required by MPEP § 821.04.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (480) 659-3314 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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